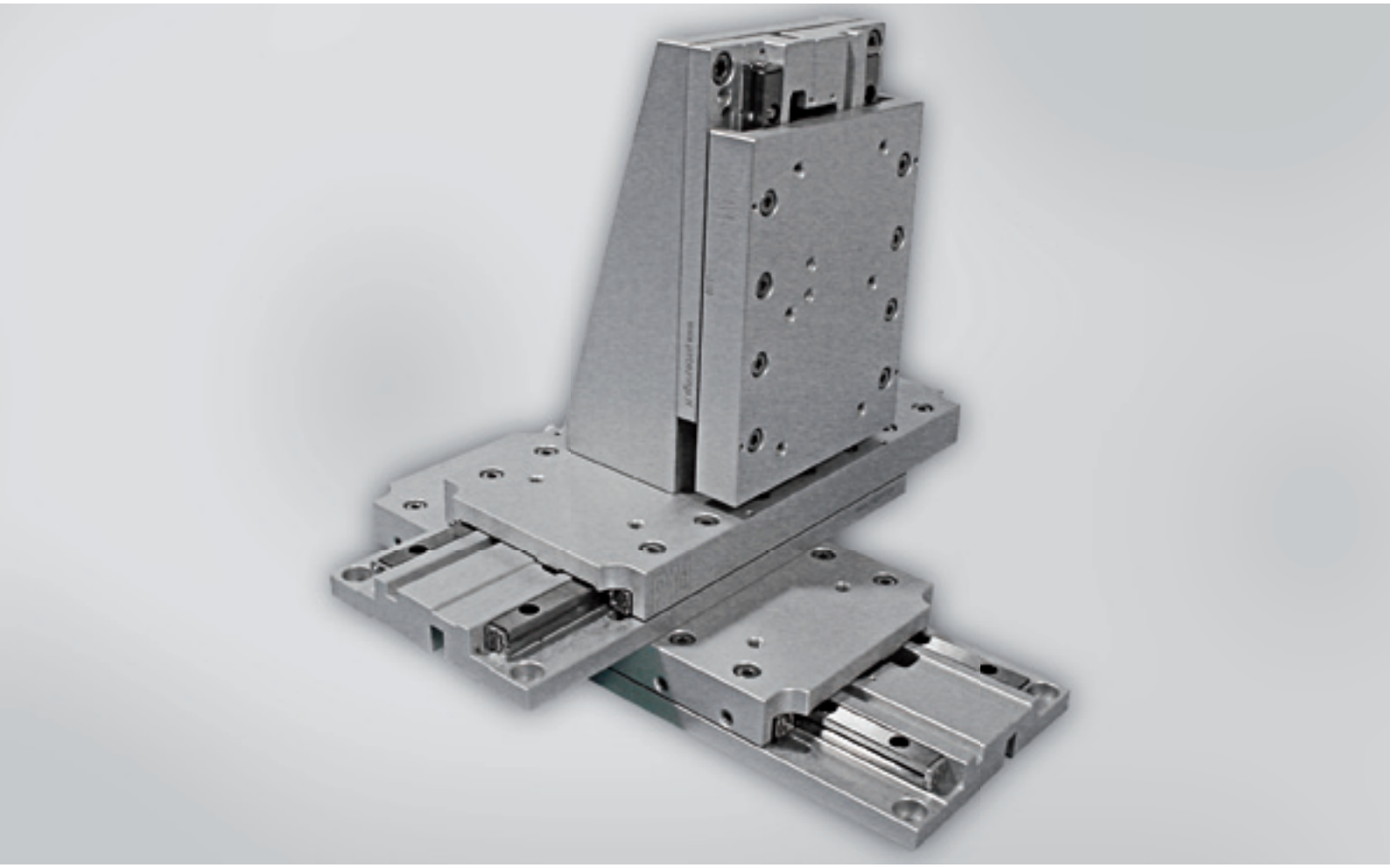
DISCOVER PIEZO



PM-BEARINGS

DISCOVER PRECISION

Precision Piezo Stages RTP

RTP Precision Piezo Stages are designed for all kinds of applications where micro- or nano positioning is needed. The design is based on engineering the stages into single- or multiple axis systems. It is a complete solution in one product and is powered by PiezoMotor and includes a Renishaw Optical Encoder. Standard product line has 3 sizes with each 3 different stroke lengths. RTP-stages have table parts made out of Aluminum and linear bearings out of standard bearing steel with crossed rollers for higher stiffness and high accuracy. Optional there are higher accuracy grades, low-magnetic and (Ultra) High Vacuum compatible solutions available. Drivers and Software are available suited for the application.

The Piezo LEGS motor:

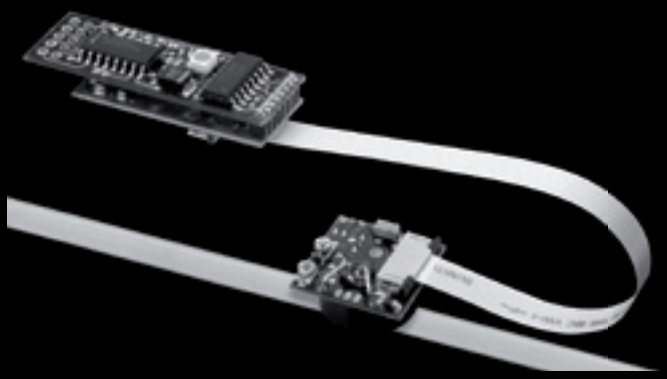
The non-resonant piezoelectric motors used in the RTP stages are manufactured by the Swedish company PiezoMotor Uppsala AB. The motors are based on proprietary technology and ideal for precision in the nanometer range. The motor element inside the motor consists of a pair of legs that can be elongated as well as bent sideways. By synchronizing the movement of these pair of legs the motor can take steps and walk. The steps are not very big just a few micrometer, but by taking several thousand of steps per second, speeds up to several centimeters per second can be reached. Each step can also be divided in increments reaching single nanometer resolution. The big advantage with this new motor technology is that it is direct driven, eliminating the need for gear boxes and lead screws. This does not only give a totally back-lash free motion, but also significantly reduce the size, making it possible to motorize even the smaller size stages. The Piezo LEGS motor comes in different versions, both rotating and linear, including models for vacuum and non-magnetic applications, as well as sizes from a few Newton to several hundred in force. The version of the Piezo LEGS motors inside the RTP stages are developed in close cooperation between PM Bearings and PiezoMotor Uppsala AB and designed to give the highest performance in the different RTP sizes available.

Benefits of the RTP-stages:

- Supports load and moments in all directions
- High load capacity and precision due to the crossed roller bearings
- Customized print or specifications possible
- Design with PiezoMotor Legs suited for nano positioning
- Complete “plug and play” system for direct integration
- Stoke lengths from 10 to 100mm (other lengths on demand)
- Cleanroom packaging available on demand

Options:

- Multiple axis configurations (XY, XYZ)
- High accuracy resolutions from 10μm to 5nm
- Low magnetic stages
- (Ultra) High Vacuum stages
- Driver and software



The Renishaw optical encoder:

The RTP-stages are all standard equipped with an optical encoder from Renishaw type RHG34. Inside the RTP-stages the scale, measuring head and a reference mark are installed. The scale pitch is 20μm and the standard resolution of the interface is 10μm. Alternative we can supply interfaces with resolutions of: 5μm, 2μm, 1μm, 0.4μm, 0.2μm, 0.1μm, 50nm, 40nm, 20nm, 10nm and 5nm. RTP-stages can also be customized with other types of encoders or brands if these will fit the envelope of the RTP-stages.

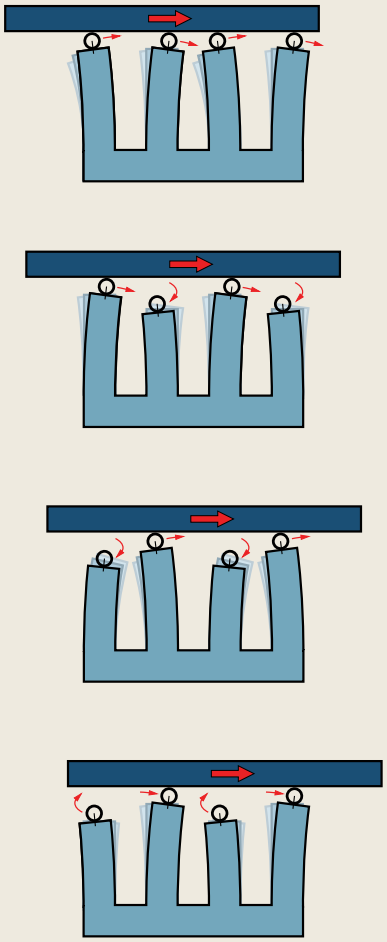
Principle of the Legs motor:

1 When all four legs are electrically activated, we find the piezo element in this position: all legs are elongated and bending. As we shall see below, alternate legs move as pairs. Arrows show the direction of motion of the tip of each leg.

2 The first pair of legs maintains contact with the rod and moves towards the right. The second pair retracts and their tips begin to move left.

3 The second pair of legs has now extended and repositioned in contact with the rod. Their tips begin moving right. The first pair retracts and their tips begin to move left.

4 The second pair of legs has moved right. The first pair begins to elongate and move up towards the rod.



Powered by:

PiezoMotor

PMCM21

PMCM31

Drivers and software:

Drivers and software can also be implemented when required. For the RTP-stages we offer 4 types of drivers suitbable for the PiezoLegs © motors. Choice of driver will depend on the application. At PM we can advice a suitable driver for your application with software. We also offer proper installation and closed loop testing.

The drivers (except the PMCM21 and PMCM31) are supplied with simple software to setup the needed movement of the stage. The software allows you to setup the most important parameters for running the motors. These parameters are: wave form, micro-step and step-delay. Running the stages in close loop is only possible by the use of a PC. The Renishaw optical encoder can be connected directly to these drivers to provide the needed feedback from the stage to run in close loop. Of course it is also possible to use your own driver and software to operate the RTP-stages.

Please contact PM-Bearings or PiezoMotor for more information on driving the stages and the software.

Drivers and software:

PMCM21 – Handheld Push Button Driver:

Hand held driver with 2 buttons to move the stage continuously forward and backwards.

PMCM31 – Analogue Driver:

The PMCM31 is an analogue driver for use with the Piezo LEGS motors. With a supply voltage (12 VDC 0.3 A) and a control voltage (±9.6 V DC), the unit can be a part of a closed loop controller design. The motor speed will depend on the magnitude of the applied control voltage whereas the direction will be according to the polarity. The driver can be operated in stepping mode for high speed, and in bending mode for fine positioning. Automatic sensor feedback requires a PC with the ability to read the sensor signal and control the analogue signal. Stand-alone controllers can be used as well.

PMCM51 – Multichannel Micro step Driver:

This is a 4 axis micro stepping driver for the Piezo LEGS motors. It delivers up to 2048 micro steps per waveform cycle, giving a 1-2 nanometer movement per micro step for a Piezo LEGS Linear Twin 20N motor. There are several waveforms available, optimized for speed, resolution or force. A quadrature encoder can be connected to the driver unit to get position control. The unit is a closed loop controller. Scripts can easily be made in a text-file to make the motors to run in desired sequences. Synchronous movement of two axis is possible. The PMCM51 uses a serial interface (RS232, RS422/485) and is equipped with an Anybus interface. The Anybus option makes it possible to communicate with TCP/IP, USB, CAN etc.

PMD90 – Micro step Driver:

This is a micro stepping driver for the Piezo LEGS motors. It delivers up to 2048 micro steps per waveform cycle, giving a 1-2 nanometer movement per micro step for a Piezo LEGS Linear Twin 20N motor. There are several waveforms available, optimized for speed, resolution or force. A quadrature encoder can be connected to the driver unit to get position control. A PC is needed to close the sensor feedback loop. The PMD90 uses a serial interface with ASCII commands.

The drivers (except the PMCM21 and PMCM31) are supplied with software to simple setup the needed movement of the stage. Please contact us for more information.

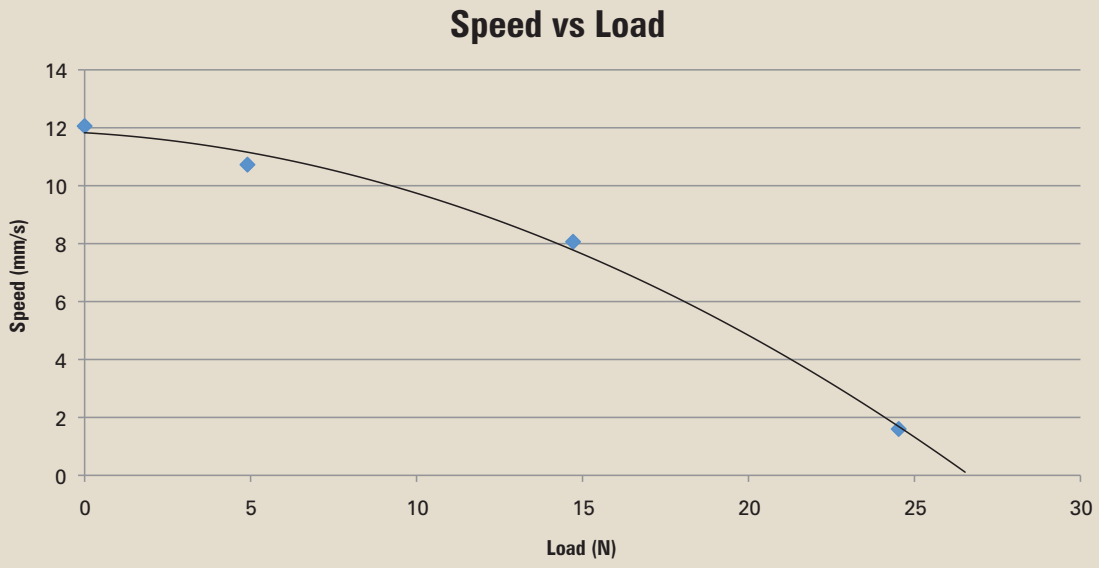
PMCM51

PMD90

Stage	Travel	Max. speed	Straight-ness	Flatness	Repeata-bility	Load capacity horizontal	Load capa-city vertical	Stall force	Motor type	Weight
	mm	mm/s	µm	µm	µm	N	N	N		Kg
RTP-1510	10	12	2	2	1,5	572	7,6	8	SP10	0,12
RTP-1515	15	12	2	2	1,5	728	7,5	8	SP10	0,14
RTP-1520	20	12	2	2	1,5	832	7,4	8	SP10	0,16
RTP-2025	25	12	2	2	1,5	1290	16,4	18	SP20	0,42
RTP-2030	30	12	2	2	1,5	1548	16,2	18	SP20	0,48
RTP-2035	35	12	2	2	1,5	1806	15,9	18	SP20	0,54
RTP-3050	50	12	2	2	1,5	2040	32,4	36	SP40	0,86
RTP-3075	75	12	3	2	1,5	2312	31,6	36	SP40	1,06
RTP-3100	100	12	3	2	1,5	3400	30,8	36	SP40	1,24

Specifications:

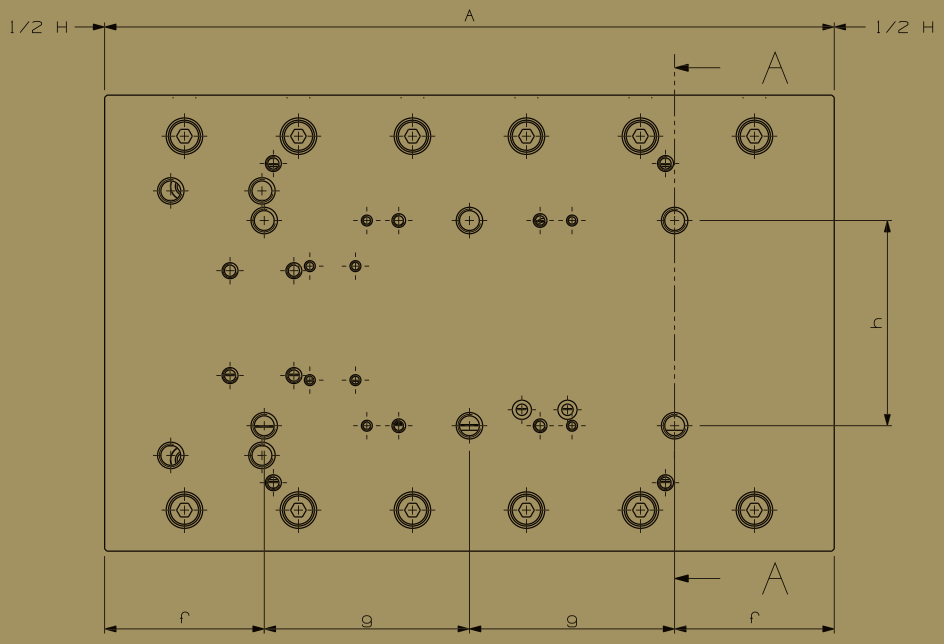
In the table above more specifications of the RTP-stages are mentioned. These specifications are based on performed tests of the RTP-stages using a PMD-90 driver. Speed of the RTP-stages is depending on the applied load on the stage. Without load the a maximum speed of 12mm/s can be achieved. When there is a load applied to the stage, the maximum speed will degrease. Below shows a standard graph with speed vs. load. For each type of RTP-stage there is a specific graph available. For more information please contact our sales office.

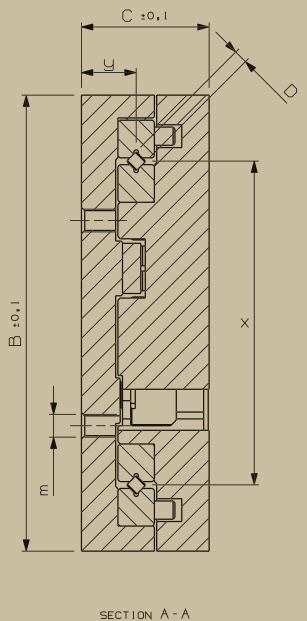


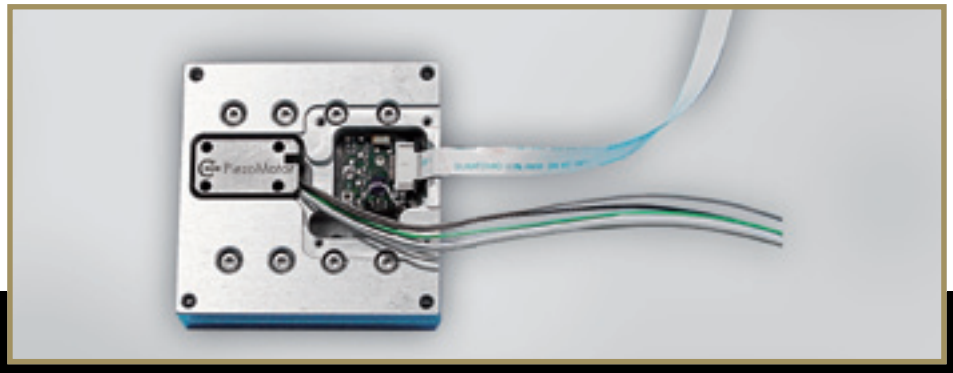
Type	mm										
	A	B	C	D	Travel H	f	g	h	m	x	y
RTP-1510	50	50	17	1,5	10	10	3 x 10	25	2	34	7
RTP-1515	60	50	17	1,5	15	15	4 x 10	25	2	34	7
RTP-1520	70	50	17	1,5	20	5	5 x 10	25	2	34	7
RTP-2025	100	70	21	2	25	15	4 x 15	30	3	50	9,5
RTP-2030	115	70	21	2	30	22,5	5 x 15	30	3	50	9,5
RTP-2035	130	70	21	2	35	15	6 x 15	30	3	50	9,5
RTP-3050	110	100	28	3	50	10	2 x 45	45	5	71	12
RTP-3075	135	100	28	3	75	22,5	2 x 45	45	5	71	12
RTP-3100	160	100	28	3	100	35	2 x 45	45	5	71	12

Dimensions:

The next drawing and table shows the general dimensions and attachment holes of the RTP-stage







Handling and usage:

Correct operation of the RTP-stages is only possible with suitable drive electronics and a controller, or a combination of device and software. The drive electronics must provide the voltage required by the Piezo Legs motor. To ensure proper performance of the servo-control system, the controlling device must be able to read out and process the signals from the Renishaw optical encoder and the reference switch.

Based on their design and realization, the RTP-stages are intended for single-axis as well as multiple-axis positioning, adjusting and shifting of loads at various velocities. We recommend mounting the RTP-stages on a fine pre-worked surface (recommended evenness $<10\mu m$) to avoid torsion of the base plate and thereby causing positioning inaccuracies and extra wear.

The operator is responsible for the correct installation and operation of the RTP-stages. The RTP-stage may only be used in applications suitable according to the device specifications. Operation other than instructed may lead to personal injury or damage of equipment.
The verification of the technical specifications by the manufacturer does not imply the validation of the complete applications. In fact the operator is responsible for the process validation and the appropriate releases.

The RTP-stages is a laboratory device as defined by DIN EN 61010. It meets the following minimum specifications for safe operation:

- Indoor use only
- Altitudes up to 2000m
- Temperature range 5°C to 40°C
- Maximum relative humidity 80% for temperatures up to 31°C, degreasing linearly to 50% relative humidity at 40°C
- Line voltage fluctuations not greater than ± 10% of the line voltage
- Transient overvoltages as typical for public power supply
- Note: The nominal level of transient overvoltage is the standing surge voltage according to the overvoltage category II (IEC 60364-4-443)
- Degree of pollution: 2

The RTP-stages are high-precision devices and have to be handled with meticulous care. To achieve a perfect linear stage, please pay attention to the following notes:

- Be careful handling the stage. Even small impact forces may damage the bearings of the stage. Damages on the guideway surface will have this impact on the running performance and lifetime.
- RTP-stages are precision devices and require proper mounting to perform at rated specifications. They have to be mounted on rigid and fine-machined, preferable by fine-milling, flat surfaces and must be supported over the entire length of the base. Hereby the characteristic qualities of a RTP-stage will be shown to full advantage.

LET US MEET YOUR CHALLENGE

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